Public Safety Management Plan
Jan Road Levee Setback Project

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1.0. Overview

This Plan has been prepared in accordance with the King County Department of Natural Resources and Parks (DNRP) 2013 Procedures for Managing Naturally Occurring Large Wood in King County Rivers. The procedures require DNRP to prepare a public safety management plan when designing projects that are expected to or are likely to cause wood from onsite or elsewhere in the watershed to accumulate at the project site. This Plan also follows Policy PROJ-11 in the 2006 King County Flood Hazard Management Plan (and incorporated by reference in the 2013 Flood Hazard Management Plan Update and Progress Report) for the monitoring and adaptive management of projects over time to meet permit requirements or improve the effectiveness of projects.

1.1 Purpose

The purpose of this Public Safety Management Plan (PSMP) is to propose a strategy to detect and respond to circumstances or changes in conditions at the Jan Road Levee Setback project site (site) that could affect public safety and infrastructure. This plan will outline safety design considerations, intended post-project site conditions, inspection and maintenance protocols, and adaptive management actions. The framework for monitoring and adaptive management in this plan may be updated as necessary to address any new public safety concerns that may arise as site conditions change both before and after project construction, and also to reflect any changes in Department policies governing site management.

1.2 Organization of the Plan

This plan is organized to first provide, in Section 2, a background of the geomorphic setting and historical conditions leading up to existing conditions, and then to demonstrate how this background information was utilized to develop assumptions for assessing future anticipated conditions. Project design included consideration of the increased potential for large scale channel changes directly upstream of the site as a result of the Rutledge-Johnson Floodplain Reconnection Project (Rutledge-Johnson project) and are therefore included in the assessment of future conditions at the site. Existing land uses described in Section 3 provide the framework for the discussion of public safety hazards and risks. Section 4 describes the approach for adaptive management.

2.0. Background

The following sections describe the physical setting, pre-construction conditions, future anticipated conditions and uncertainties of the project reach, which will influence the long-term management strategy for the project site.

2.1 Project Location and Setting

The Jan Road Levee Setback project area is located on the left and right banks of the Cedar River, between River Miles 12.6 and 13.3 in unincorporated King County, about one mile northwest of the State Route 18/State Route 169 interchange.

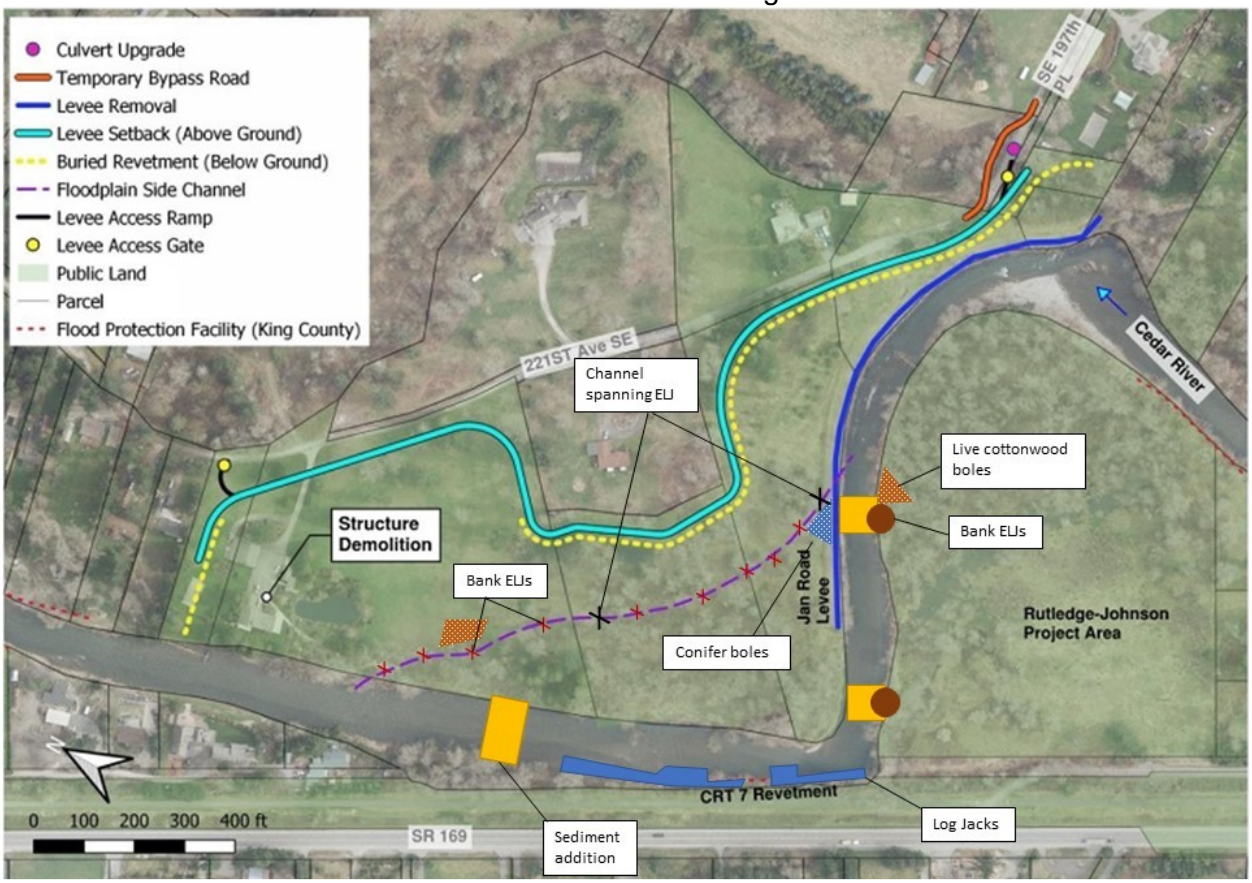

Figure 1. Jan Road Levee Setback Project Area Map

2.1.1 Hydrologic and Geomorphic Setting

The Cedar River hydrology is dominated by the upstream Seattle Pacific Utility dams that are utilized for drinking water and hydroelectric power. There are a limited number of smaller tributaries below the last dam, so hydrology in the vicinity of the project site is generally the same as what is released from the Landsburg Diversion Dam. Since regulation (1914), the magnitude of large floods within the lower Cedar River has decreased substantially, with post-dam 2, 10, and 100-year recurrence interval flows reduced by approximately 47, 54, and 56 percent, respectively (Gendaszek et al, 2102). High flow conditions provide depths and velocities that can erode streambanks and transport gravel and cobble as bedload, resulting in channel migration and re-distribution and re-shaping the bed and banks of the river.

Prior to construction of levees and revetments in the 1960s, the Cedar River channel within the geomorphic study area migrated within the floodplain. Construction of levees and revetments along the majority of its length have contributed to straightening and confinement of the channel, resulting in increased depths and velocities, elimination of salmon spawning and rearing habitats, and reduction in overall sediment and wood storage potential. Levees and revetments constructed generally on the outside of bends, have been effective at slowing channel migration. Unmodified bank conditions are generally stable within the project area, particularly along straight reaches or inside bends. However, in-channel sediment deposition and erosion on the right bank along with upstream large wood accumulations resulted in up to 30 feet of channel widening between RM 13.0 and 13.1 during the recent February 2020 flood event (King County, 2022b). Observations of bank erosion along unprotected bends outside of the project area appeared to be controlled by underlying bank condition (e.g., unprotected gravel/cobble) and local conditions that direct streamflow at these unprotected banks such as mid-channel deposition. There did not appear to be a correlation between instream large wood and bank protection or scour at unmodified banks; the size of wood within the study area was primarily so small that it was not effective at altering channel hydraulics during high flows appreciably (King County, 2020). Mapping of the active channel margins, from aerial photographs and LiDAR between 2000 and 2018 (King County 2015 and this report), suggest that the left bank is eroding just upstream of the sharp bend near RM 13.15 (CRT 7 Revetment), exacerbating erosion and further directing the main flow at the revetment. Note that due to position error inherent in use of the aerial images and LiDAR data, measured bank erosion rates at this location are within the range of measurement error, but the general trend of bank erosion is evident (King County, 2020).

Main channel substrates within the project reach generally consist of gravel and cobble. Surface and sub-surface samples indicate the bed is well armored and the system is supply limited. Sample locations are representative of areas generally constrained by levees and revetments, where armored conditions are more likely, due to higher velocities winnowing out the finer particles from the surface layer. These armored bed conditions resulted in sufficiently less channel change during the recent February 2020 flood event, when compared to other portions of the Cedar River (i.e. Rainbow Bend project site, about RM 11.3). However, there was a small amount of bank erosion, some changes to the channel bed bathymetry and substrate size, and movement of woody material (**Error! Reference source not found.**). The surficial floodplain geology in both areas is mapped as Quaternary alluvium, and consists of layers of cobble, gravel, sand, and finer overbank deposits (WDNR 2019). Lower riverbank is generally a combination of medium dense compacted sand with gravel and rock armoring (along levees and revetments).

An inventory of instream wood in August 2019 between RM 13.05 and 13.55 counted a total of 64 pieces of wood, the equivalent of 128 pieces/mile. The majority (61%) of wood in this reach were smaller than 25 feet long and 16 inches in diameter. This and other large wood inventories have shown that the overall wood loading is low when compared to regional metrics for adequate levels of instream wood (King County, 2020). Based on the 2020 wood survey, the majority of wood surveyed during 2019 was transported out of the reach, as a result of the February 2020 flood event, including the 95 foot long cottonwood log (with root wad) that was transported 0.2 miles downstream (Figure 2) (King County, 2022b).

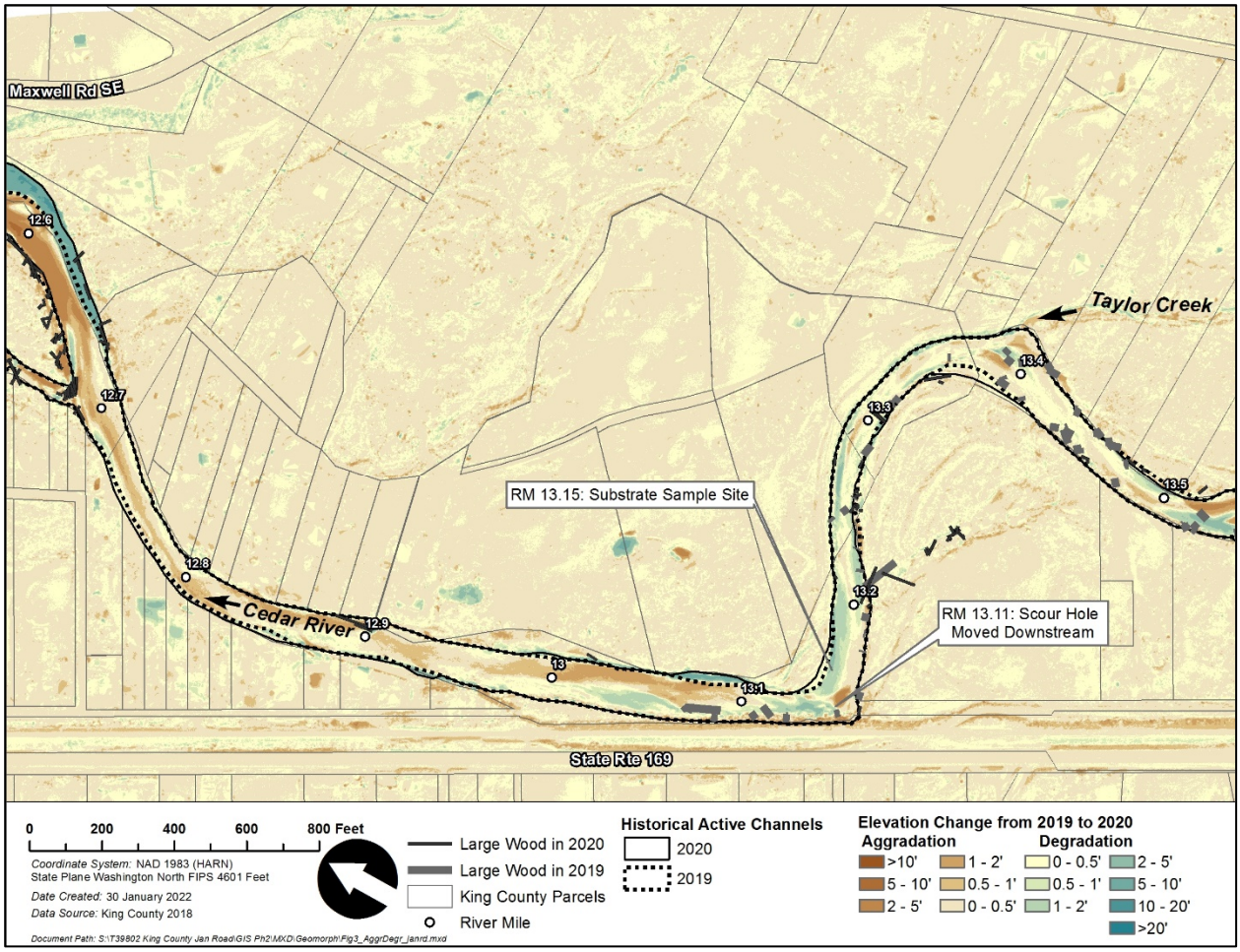

Figure 2. Areas of Aggradation/Degradation (2019 to 2020), Recent Bank Erosion, and Large Wood Changes at the Jan Road Project

2.2 Project Background

2.2.1 Pre-construction Conditions

During Cedar River flood events of approximately a 20-year recurrence interval (approximately 6,016 cfs) or greater, overbank flows cause overtopping of the neighborhood sole access road SE 197th Place/221st Avenue SE/228th Avenue SE [access road], resulting in hazardous conditions for people and damage to property. Flooding induced impacts to access for residents has occurred most recently as February 2020 and previously in January 2009. As many as 15 residences in the immediate vicinity would be isolated during a 100-year recurrence interval flood event (approximately 9,443 cfs).

Existing streambank conditions include riprap along levees and revetments and unmodified banks along the inside bends. Most of these banks are relatively stable and show little sign of erosion within the project area, however, the levee and revetment have experienced erosion and scour in the past. The levee, in its current alignment, concentrates and directs flow at the revetment, increasing the vulnerability of both to erosion and scour. Neither facility meets current engineering standards for stability. There are no utilities within the revetment embankment. Stable riprap calculations for the existing condition resulted in rock size and

thickness similar to what was observed in the field (existing revetment rock is generally sufficient to resist particle erosion).

Existing large wood levels in the project area are relatively low. Based on wood surveys, the majority of this wood was small (less than 13 feet long and 8 inches in diameter), with only one piece large enough to be considered a key piece (wood that is large enough to be stable and accumulate additional wood). Although the majority of large wood is transported through the project reach, some of the large wood is trapped in wood jams and sediment bars within the river and can become re-engaged during high-flow events of sufficient magnitude and duration to initiate sediment transport. Consequently, downstream properties and infrastructure are already subjected to substantial quantities of logs and large woody material conveyed by the river during high flow events.

2.2.2 Project Goals and Objectives

The project goals are:

- Reduce overall flood-related risks to people, property, and infrastructure, including the Jan Road Levee, the Cedar River Trail, and SR-169,
- Ensure new flood protection infrastructure (levee and revetment) meets current engineering standards to minimize long-term site management costs.
- Provide all required mitigation for the 2017 Cedar River wood relocation efforts.
- Improve natural riverine and riparian processes, functions, and habitat.

2.3 Post-Construction Conditions

2.3.1 Post-Construction Project Features

The project consists of the following primary elements:

- Existing levee removal
- Levee setback
- Buried revetment
- Roadway box culvert
- Floodplain side channel
- Engineered Log Jams (ELJs)
- Native vegetation plantings
- Overhead power relocation

2.3.2 Anticipated Post-construction Conditions

Removal of the existing Jan Road levee will likely result in migration of the main channel toward the SE 197th Place roadway culvert. A biorevetment has been included as part of the design to limit channel impingement upon the new culvert and roadway. Aggradation is not predicted within the mainstem, at the location of the culvert.

Existing levee removal and construction of the side channel in the floodplain will allow the mainstem Cedar River to migrate into the right bank floodplain. Channel migration is anticipated to proceed via channel widening at the apex of the RM 13.25 -13.35 meander bend. The new Jan Road setback levee has been designed to accommodate anticipated future channel migration and flow conditions, including the likelihood of channel occupation and impingement

on different parts of the setback levee. The Jan Road levee will continue to provide protection to the access road from channel migration.

The design slope of the side channel is 1.3 that of the mainstem channel, indicating low avulsion potential under design conditions (Slingerland and Smith, 2004). It is anticipated that aggradation will occur in the mainstem channel downstream of the side channel entrance, with 3-5 feet over the moderate term (10-20 years), bringing the elevation of the mainstem riverbed closer to the floodplain elevation at RM 13.25. Over this same moderate term, it is anticipated that the mainstem will migrate 50-70 feet (about one channel width), toward the right bank. The net result is that the time to aggrade one channel depth above the surrounding floodplains (20-40 years) is approximately twice the time to migrate one channel width. Therefore it is anticipated, based on the Jerolmack and Mohrig (2006) analysis, that the potential for main channel avulsion is low to moderate over the moderate term. Large wood installations within the side channel and establishment of additional floodplain vegetation will add to the overall hydraulic roughness of the right floodplain, further limiting the potential for development of avulsion set up conditions. However, these conclusions are highly dependent on the magnitude of flow in the Cedar River as well as upstream management activities that may impact the supply of wood and sediment. The likelihood of future channel occupancy in the right bank floodplain is shown in Figure 3, with the potential maximum impingement of flood protection facilities representative of an approximate 20- to 50-year timescale (King County, 2022b).

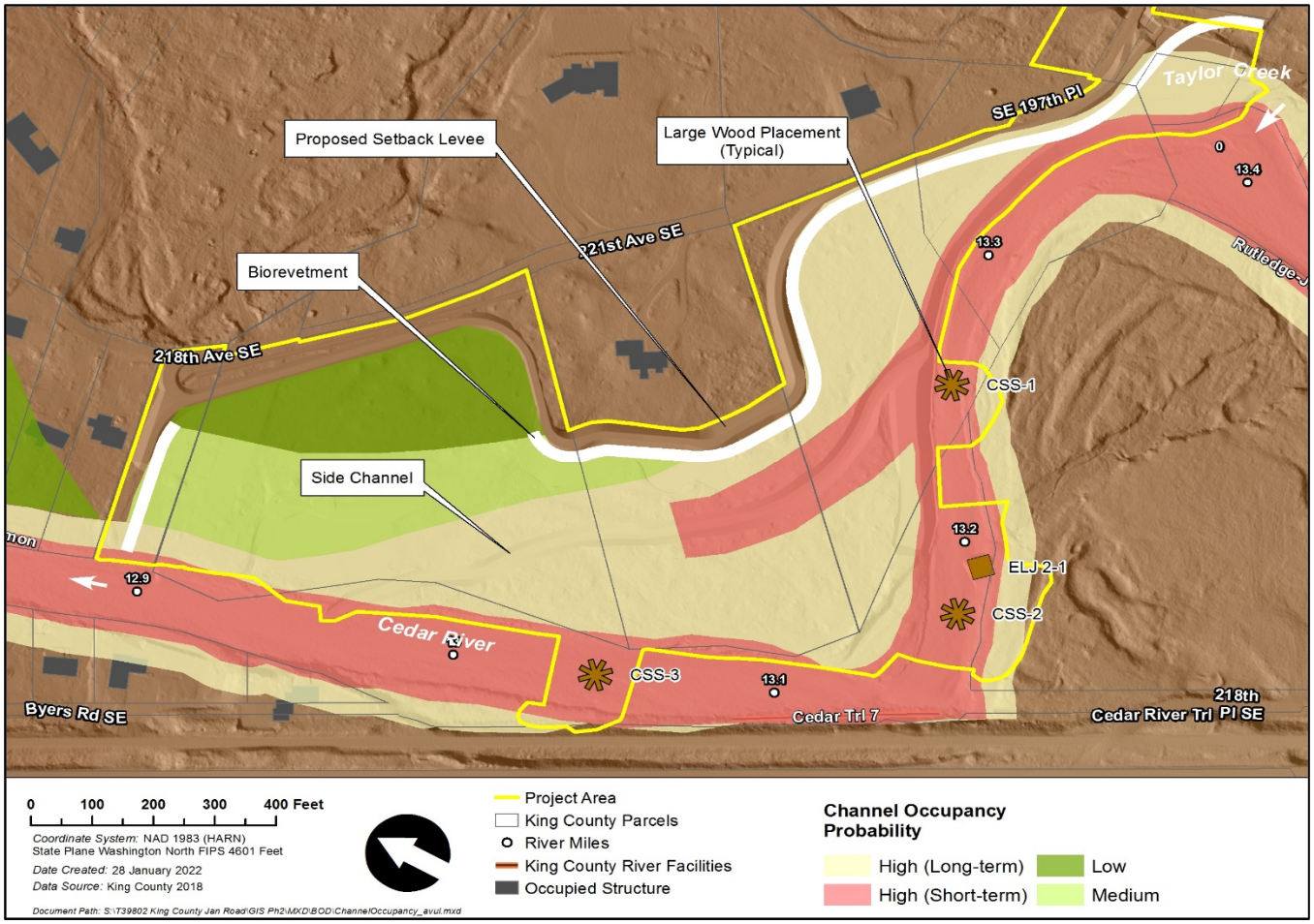

Figure 3. Channel Occupancy Probability

Main channel ELJs are primarily intended to disrupt and redirect erosive energy (high flow velocities) into the right floodplain and reduce erosive forces near critical infrastructure (i.e. Cedar River Trail, SR 169). Large wood structures BE 1-1 and BE 1-2 (locations of CSS-1 and CSS-2, respectively [Figure 3]) will help to direct mainstem flows away from the upstream end of CRT7. Ballasted Wood Jack (BWJ) units will be placed along the CRT7 revetment to reduce erosion and scour potential along the facility and further mitigate geotechnical slope instability via buttressing of the toe. BWJ planform geometry will feature two retarder spurs, located near locations of greatest estimated flow intensity, to divert flows away from the bank and allow for more varied hydraulic conditions along the bankline. BWJ placement will not occur within the approximate footprint of the 1998 repair to allow for the existing deep pool to be maintained and limit the potential for destabilization of the slope at this location. The permeable spur directly upstream of this portion of the facility is anticipated to provide reduction in erosive forces along this portion of the facility during high flow while still providing maintenance of the existing pool over time. BWJ units will be extended upstream to the limits of the "High (Short-term)" Channel Occupancy Probability boundary (**Error! Reference source not found.**). Floodplain ELJs will provide hydraulic diversity as the side channel evolves over time in response to high flows, resulting in variable hydraulic conditions that scour and deposit sediment, creating diverse substrate conditions and a variety of aquatic habitat features (e.g., small scour pools and gravel bars).

Wood is placed within the mainstem, constructed side channel, and floodplain to meet provisions of the 2017 Cedar River Wood Relocation HPA (WDFW, 2017). Based on observations of similar projects in the Cedar River, it is anticipated that mainstem ELJs will collect additional large wood, as will any structures located at the outside of meander bends and at the primary side channel inlet. Over the short term (0-5 years) it is anticipated that minor accumulations of large wood on the constructed wood structures will occur because there would be limited wood in transport from upstream sources during small magnitude floods (2-year recurrence interval). More substantial wood transport from upstream sources would be anticipated during a 10-year or higher recurrence interval flood, based on racking of wood at similar levee setback projects on the Cedar River. All ELJs are designed to withstand hydraulic forces representative of 100-year recurrence interval flood conditions. ELJs are also designed to withstand forces under assumed wood racking conditions (King County, 2022a). As wood accumulates on the large wood installations within the mainstem and side channel, channel widening and sediment accumulation is expected to occur, resulting in channel migration as discussed above. Channel widening in the mainstem and side channel described above could recruit additional large wood as mature trees on the floodplain are undercut and topple into the channel(s); however, wood recruitment would likely be limited in the short term due to the absence of large trees in areas of anticipated short-term channel migration. Large wood structures in the mainstem channel are intended to provide slow water habitat conditions within the main channel and encourage distribution of main channel flows into the side channel over time. In the short- and medium-term, these ELJs may become buried from the predicted aggradation in this section of the mainstem (see discussion above). However, as the river migrates toward the right bank the main channel may migrate away from and flank the structures. If pieces of root wad protrude high enough into the low flow channel, they may be hazards to recreational floaters. If pieces of the root wads protrude into the water column during peak flows, they may also catch large wood moving in the flow and begin racking wood and possibly form a mid-channel log jam which could direct mainstem flow around the jam. Some wood will be transported downstream during subsequent high flow events and some will rack up on the ELJs and reside on the logjams for a period of time or semi-permanently. Wood remaining on the ELJs will be monitored and managed as described in Section 4 below.

The sizes and total quantity of racking and slash materials that will be used are very small relative to the quantity of naturally available and recruited materials conveyed by the river past the site during high flow events. It is also anticipated that the majority of upstream wood transport, and that recruited from the site, will be stored within the project reach. It is anticipated that the mainstem channel will not migrate substantially, downstream from RM 13.1. There is low likelihood of significant impacts to downstream properties and structures resulting from transported logs and woody material, whether from the project site or naturally recruited. The closest bridge (Cedar Grove Road Bridge) is about two miles downstream and is able to convey significant wood and debris because it does not have mid-channel bridge piers (piers at toe of bank, approximately 100 foot opening) and the low chord of the bridge deck is well above the level of the adjacent floodplain. The next downstream bridge is Cedar Mountain Bridge at RM 9.4, about four miles downstream, with a similar ability to convey wood and debris.

2.3.3 Uncertainties

Geomorphic response conclusions described above are highly dependent on the magnitude of flow in the Cedar River as well as upstream management activities that may impact the supply of wood and sediment. Given the dependency of wood transport on flows, the potential for and likely duration of accumulation of wood on the face of the ELJs is similarly dependent upon flow magnitudes and upstream watershed management activities.

In addition to channel migration that could occur as an intended result of the project, removal, alterations, or failure of upstream levees could result in channel migration or avulsion that could affect the project area in the future. Potential channel avulsion pathways were delineated based on low-lying topographic features that include historical channel positions and King County (2015) avulsion hazard mapping (**Error! Reference source not found.**). These include: 1) avulsion into an old left bank side channel if the upstream Rutledge-Johnson levee is altered or removed; 2) avulsion into old main channel locations on the right bank if the upstream right bank levee near RM 13.8 were altered or breached; and 3) an unlikely, higher elevation avulsion pathway into an old mainstem channel on the right bank near Taylor Creek if the river breached the existing roadway/levee at the mouth of Taylor Creek (King County, 2022b). Main channel ELJs were positioned to provide similar flow redirection and general reduction in erosive forces along the left bank, under the potential upstream left bank floodplain avulsion condition (Location 1, Figure 4). ELJs were checked for stability under a scenario representing such conditions.

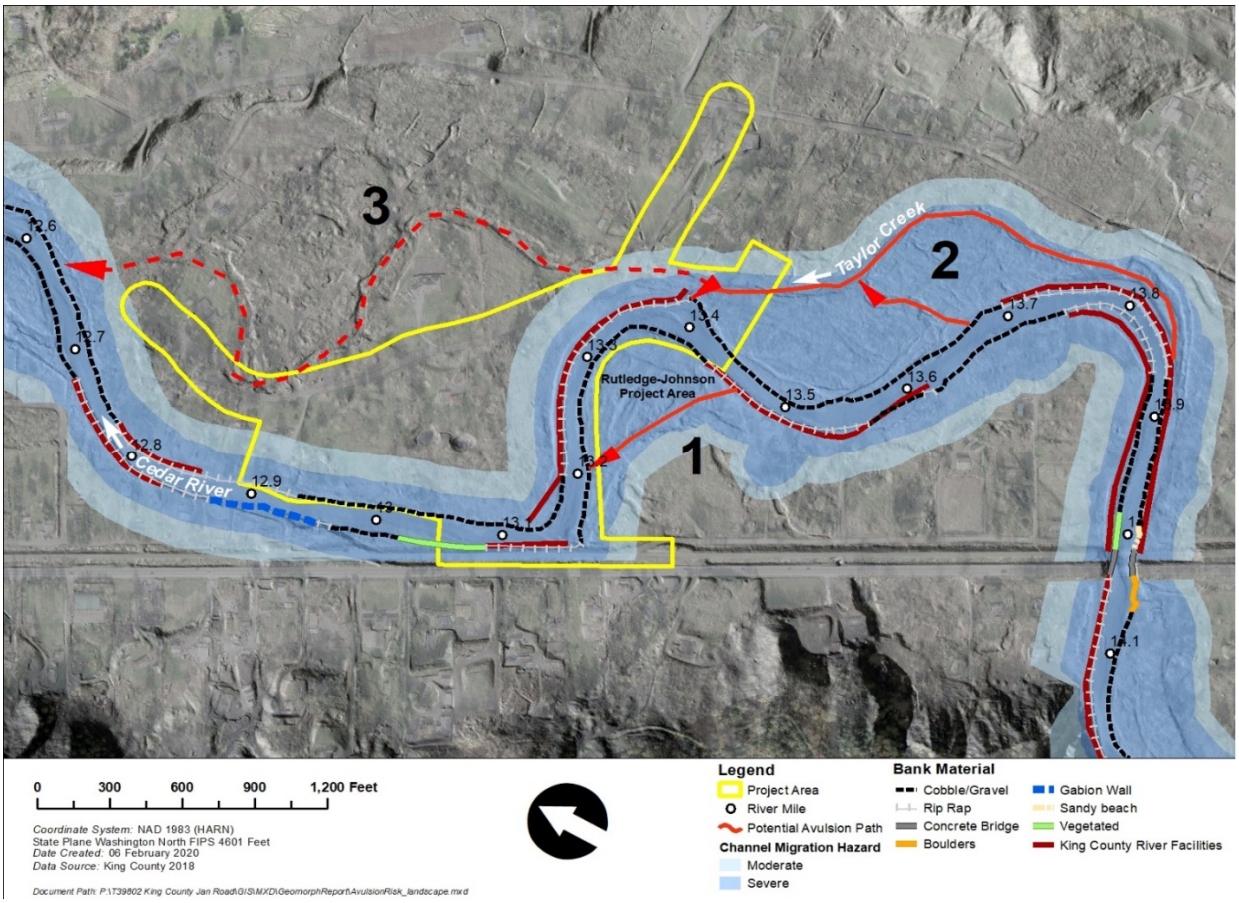

Figure 4. Potential Avulsion Pathways in the Project Vicinity if Levees or Revetments are Removed or Breached

3.0. Hazard and Risk Assessment

3.1 Existing Public Uses in Vicinity of Project Site

The preconstruction land uses and potentially affected infrastructure in the vicinity of the project site are described below.

3.1.1 In-Water Recreation

Recreational use of the project site consists primarily of the general public trail access, site-seeing, bird-watching, fishing, and general river access. From the 2013 King County Recreation survey, water-based access (rafting, tubing, swimming, wading, etc.) at and through the project site appears to be low relative to other segments of the Cedar River. Average use per day at the Cedar Grove Road crossing (about 2 miles downstream) was about one person per day, during the summer recreational period (King County, 2013). Given the trend of decreasing use in the upper reaches of the river, it is anticipated that average use is even less than at the Cedar Grove Road crossing. Although levee and revetments line the majority of the banks within the project reach and promote wood transport, accumulations of naturally recruited large wood in the river channel have been observed within the reach, creating potentially hazardous conditions for in-water or in-channel recreational activities.

3.1.2 Land Use

The surrounding properties in the general vicinity of the project site are predominantly single-family residential (ten) and public natural areas (four). The project site is situated on parcels owned by King County River and Floodplain Management Section (RFMS) and King County Parks (Parks). The Cedar River Regional Trail borders the project site (adjacent to Cedar River left bank) and supports active and passive recreation. Water-dependent active recreation includes floating (inner tubing) and fishing. On the shoulder of Cedar River Trail adjacent to the project site there is an informal vehicle pullout area that supports passive recreation. An informal user-created footpath down the riverbank provides access to the floodplain on the left bank of the Cedar River. An encampment was discovered in spring 2022 along the left bank of the Cedar, near RM 13.2. The encampment was located within the extent of planned construction activities and was therefore removed per current King County policy, to ensure safe working conditions for the public and construction contractor.

3.1.3 Roadway and Drainage

Properties surrounding the site and those within the site are only accessible via a single roadway, SE 197th Place/221st Avenue SE/228th Avenue SE (access road). The Renton Maple Valley Rd SE (SR 169) borders the project site (adjacent to Cedar River left bank) and is of critical importance for regional access.

The 12” diameter pipe previously under SE 197th is insufficient to convey overland flows during flood conditions and restricts neighborhood egress.

3.1.4 Utilities

There are no known underground water, sewer, or gas utilities within the project limits. Private wells and septic systems that served the properties prior to acquisition by King County have either been removed or will be removed prior to construction. Existing overhead utilities, owned and maintained by Puget Sound Energy (PSE), include power supported on utility poles.

Telecommunications lines are also supported on the utility poles. There are no known utilities within the CRT 7 Revetment embankment.

Overhead utility poles will be protected, where possible, during construction of the setback levee near the neighborhood access road. However, two overhead utility pole and two associated guy anchors will need to be relocated in order to accommodate levee construction. Utility pole relocation will be coordinated with PSE prior to construction.

3.2 Public Safety Risk Analysis and Design Response

3.2.1 Public Outreach

Project information about large wood placement follows the County's communication protocol. This includes sharing project information on the DNRP Large Wood project website and outreach through the Large Wood public meetings (project presented annually from 2019 through 2022). Public comment is available through the website and at the meetings. Further opportunity for public review and comment was afforded as part of the State Environmental Policy Act (SEPA) review period.

Prior to project construction, mailers and in-person meetings will be held with adjacent residents to inform them of the overall construction schedule, potential impacts to access and power, as well as the potential for changing river conditions once the project is substantially completed. All project design materials, such as design drawings and basis of design reports, have been made available to the public via the project website.

Subsurface conditions encountered during construction made for very slow production rates for pile installation, with completion of work per the original design was determined to be infeasible, with respect to schedule and budget. In order to maintain the project schedule and budget, a value engineering process a value engineering process was initiated to modify the ELJ structure design in both the side channel and also the main channel. Concurrently, coordination meetings with RFMS maintenance staff and the King County Prosecuting Attorney Office (PAO) to discuss plans for river users detour during construction resulted in a recommendation by both the PAO and RFMS maintenance staff to meet with the King County Sheriff's Office (KSCO) on site to discuss the proposed design and approach for management of river users both during construction and for the life of the project. KSCO representatives communicated strong reservations about the safety of the original design. The PAO made clear that comments from the Sheriff needed to be addressed during the value engineering process for the main channel. All public safety risk mitigation measures (discussed below) were reviewed and approved by KSCO and River Safety Council (RSC) representatives prior to implementation (King County, 2022c).

3.2.2 In-Water Recreation

The primary risk to in-water recreationalists is entrapment and drowning amid fallen trees and other natural large wood in the river. However, at the project site, flow velocities are low and flow depths relatively shallow during the summer when most of the recreational use occurs (King County, 2021).

Although recreational use within the project reach is low, the design includes various measures for mitigation of the potential hazards (American Whitewater, 2012). During construction, the channel-spanning widths of mainstem ELJs was reduced to provide a low-flow channel for river

users to navigate through the project reach. In addition, directly upstream of the ELJs is a bumper log system intended to guide river users around these ELJs. The bumper log system consists of horizontal (bumper) logs affixed to timber piles via a chain leader, allowing the bumper log to float within the range of typical river use discharges (266 [20% exceedance statistic for July – September, typical innertube use] and 1289 [20% exceedance statistic for February – May, typical kayak use] cubic feet per second), guiding river users around the ELJs and similarly shed transported logs and woody material. Tethered bumper logs are affixed to the BWJs (varied leader length) along the upstream end of the treatment, and along the face of each BWJ spur. Bumper logs are not applied to the downstream portion of the BWJ treatment, given the ample sight distance and limited anticipated channel change over time (King County, 2022c). Additionally, signage has been placed within the project reach to alert in-river recreationists to constructed large wood hazards, consistent with current design guidelines (Skellenger & Bender Attorneys, 2007) and coordination with the PAO. Future modifications to existing or additional signage will be done in accordance with the process described in section 4.

Although channel changes at the site are expected over time, it is anticipated that the existing low (recreational use) flow channel planform will be generally maintained and that the various hazard reduction measures will continue to perform in a similar capacity over time. Future modifications to existing or additional portages will be done in manner similar to that for signage.

3.2.3 Land Use

The project will reconnect approximately 14 acres of river floodplain. These lands will become public space, resulting in the potential for increased public use of the project area, a concern shared by many local residents. Gates will be installed at the north and south levee access ramps to secure maintenance road access. In addition, the landward (east) slope of the levee setback will be planted with native vegetation that will limit potential access points over time.

Campers are anticipated within the left bank floodplain, given the history of activity. Access from this bank may increase risk that the public would climb on the constructed ELJs. Cottonwood boles will be installed within the left bank floodplain, directly adjacent to the ELJs, which may make access more challenging, thereby discouraging access to the ELJs.

Critical failure slopes for the Cedar River Trail Site 7 (CRT 7) Revetment were determined to be at the back of the revetment armor rock. This condition could be remedied via emergency repair, during flood conditions, with limited impact to critical infrastructure (no utilities within embankment). Co-managers of the Cedar River fishery requested more placement of large wood within the main channel and preservation of the existing deep pool habitat and mature trees adjacent to the revetment. Cumulatively, main channel and floodplain ELJs will result in appreciable reductions in erosive forces along the Cedar River Trail Site 7 (CRT 7) Revetment (approximately 50% reduction in the required rock size and thickness [USACE, 1994]), providing an overall reduction in flood risks (e.g. potential for displacement of existing armor and scour potential, and potential for progressive bank failure) and future maintenance needs to this facility and to the critical infrastructure it protects (i.e. Cedar River Regional Trail and SR 169).

3.2.4 Roadway and Drainage

Under pre-project conditions, flood depths over the access road are estimated at about 17 inches, for the 100-year recurrence interval flood event. Six inches of water will reach the bottom of most passenger vehicles and cause loss of steering, while 12 inches of water can cause many vehicles to float away (FEMA, 2007). The new roadway culvert (buried structure) at SE 197th Place is sized to convey the 100-year flow with no more than six inches over the

roadway surface, to allow egress for residents and reduce the potential for damage of the access road during flood conditions. Standard beam guardrail will be provided along the upstream and downstream faces of the culvert.

A new 24-inch concrete culvert will also be added under the North Access Ramp to provide a flowpath for water that would otherwise pond behind the levee during high flow events. The culvert will be beveled at the inlet and outlet to match the levee access ramp side slopes. Energy dissipation is provided via a rock pad (King County, 2016).

3.2.5 Utilities

Overhead power lines cross or are in near proximity to both levee access ramps. Minimum clearance (10 feet) is provided from typical dump truck height (12 feet). Appropriate clearances should be confirmed prior to mobilization of heavy equipment to the site.

3.3 King County Procedures for Placing Large Wood in Rivers

King County Public Rule LUD 12-1 adopted on March 31, 2010 (Appendix B to this Plan) establishes procedures for the consideration of public safety when placing large wood in King County rivers. The procedures apply to all King County DNRP projects involving the placement of large wood in King County rivers and streams.

Section V, Part 4 of Appendix A of the Public Rule includes requirements for post-construction monitoring and the adaptive management of projects involving the placement of large wood to assess whether any new actions at the project site are warranted. Such actions may include outreach to advise the public of potential risks posed by placed large wood, placing warning signs at the site, notifying the local jurisdiction that may impose use restrictions, and removing or altering the position of placed wood to further reduce risks.

3.4 King County Procedures for Responding to Naturally Occurring Large Wood

DNRP's 2013 Procedures for Managing Naturally Occurring Large Wood in King County Rivers applies to locations within unincorporated King County, like the project site. The procedures have been incorporated into Section 4.0 of this document.

4.0. Monitoring and Adaptive Management Strategy

4.1 Roles and Responsibilities

As part of routine site management, existing flood monitoring programs, and broader public safety and emergency management services, King County will conduct regular observations and monitoring at the project site. These activities will consider site conditions that could potentially impact public safety or public or private property and infrastructure and will aim to identify appropriate remedial actions when necessary. The roles and responsibilities are summarized below in Table 1.

Table 1. Public Safety Roles and Responsibilities

Jurisdiction or Agency	Roles	Responsibilities
King County River and Floodplain Management Section (King County) as the primary service provider to the King County Flood Control District	Manage the Jan Road Levee Setback project site.	Monitor, inspect, and maintain the integrity and function of the project components. Coordinate with local jurisdictions to address public safety.
King County Flood Control District	Provide funding for capital improvement projects, ongoing site management, and facility maintenance for purposes of flood risk reduction.	Reduce flood risks to people and property in King County.
King County Office of Emergency Management	King County coordination center for disaster preparedness, response, and recovery.	Coordinate regional services and resources during a disaster or emergency.
King County Sheriff's Office	Provide expertise in the assessment of risks to river recreational users and swift water rescue.	If requested, provide technical support to local jurisdictions for the assessment of hazards to river recreational users.
Seattle Public Utilities (SPU)	Operation of Masonry Dam.	Operate Masonry Dam to reduce flood risks (to the extent feasible) on the Cedar River. Coordinate flow releases with King County.
King County Fire District 43 – Maple Valley Fire Department	Emergency service provider for Maple Valley and unincorporated King County.	Assess public safety risks. Coordinate with the jurisdictions they serve to restrict recreational use in the river. Provide rescue and recovery from flood and swiftwater environments.

As the project proponent, King County will serve as the lead agency for the management, monitoring and inspection of the various elements comprising the project. King County will play an active role in the assessment of hazards that present a risk to the function and integrity of the facilities and will provide input and assistance to the various jurisdictions and agencies to address hazardous conditions that may pose a risk to public safety and river recreational users.

4.1.1 Response Levels

The time needed to evaluate and implement adaptive management measures will vary depending on the complexity and immediacy of the problem or hazard (Figure 5). Immediate action may be needed to address a failing bridge pier, for example, but is not likely needed to remove a potential hazard tree that falls into the river in December. Addressing concerns posed by wood hazards may prove the most challenging and may require weeks to months to implement. If a decision is made to modify instream wood, this would typically be done in the

summer and with prior approval from local and state regulatory agencies. Wood hazards are to be managed according to the King County policies in effect at that time.

Where signage is a sufficient response, it should be deployed in highly visible locations and maintained and removed until the hazard is abated. Signs will be placed and regularly monitored by County staff, and replacement of the warning signs will occur if signs are damaged or lost. Public outreach should target river users most likely to encounter the hazard. Improvements at access and egress points should be coupled with warning and notification signs. River closure can also be implemented by the King County Sheriff Office.

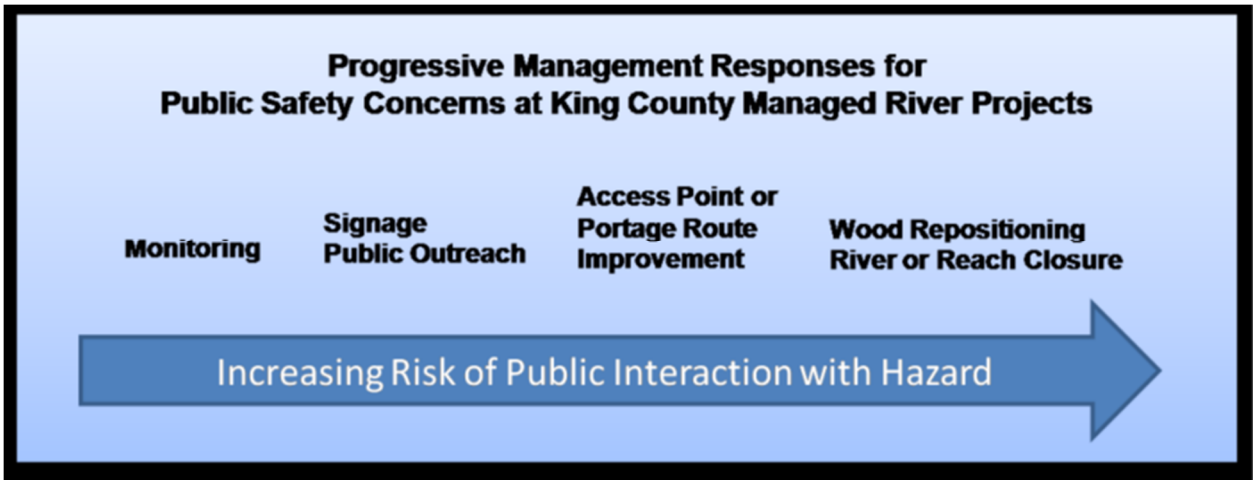

Figure 5. Progressive Management Responses for Public Safety Concerns at King County Managed River Projects.

4.2 Emergency Response

In the event of a flood emergency, the King County flood patrols and project technical leads would report observations to the Flood Warning Center. If the Flood Warning Center is not open, observations would be reported directly to the King County Office of Emergency Management. Depending on the emergency, County staff may also contact the cities, regional fire districts, and Seattle Public Utilities. In accordance with Policy ER-3 in the 2006 King County Flood Hazard Management Plan (and incorporated by reference in the 2013 Flood Hazard Management Plan Update and Progress Report), King County should consider long-term objectives for risk reduction and habitat restoration when implementing emergency response actions.

4.3 Monitoring, Inspection and Maintenance

The inspection, monitoring, and maintenance of the new project elements (levee, ELJs, culvert) will occur in accordance with the Site Management Plan, which includes this Public Safety Management Plan (PSMP) and the 10-year Jan Road Levee Setback Monitoring Plan (MP) as appendices to the Site Management Plan. The Site Management Plan specifies overarching goals and uses of the project site and the inspection, monitoring, and maintenance protocols for the flood-protection components of the facility as documented in the PSMP and MP. The Site Management Plan will be updated periodically to reflect changes in site conditions and site management needs and strategies. The Site Management Plan also includes protocols for the monitoring and reporting of river recreational hazards related to large wood. The Monitoring

Plan includes a one-time assessment of project conformance with the project design, followed by the periodic monitoring of habitat conditions and fish use for the first ten years following project construction. The MP includes habitat monitoring elements that meet the requirement of federal and state permits issued for the project.

4.3.1 Monitoring

The County will monitor physical channel conditions, habitat conditions, and fish use in accordance with the Monitoring Plan (King County, 2022d). The Monitoring Plan will compare site conditions with established performance standards and implement adaptive management actions if the performance standards are not met according to the monitoring schedule. Physical channel conditions will be monitored in the constructed floodplain side channel as well as the mainstem Cedar River, including active channel area, sediment movement and physical characteristics (i.e. surface size), and groundwater connectivity. Habitat conditions to be monitored include changes in the area of slow water (velocities less than 1.5 feet per second), wood loading, percent coverage by native riparian vegetation and invasive plants, use of snags by wildlife, and the restoration of wetland areas impacted by construction. The fish use to be monitored includes the use of low-velocity water by juvenile salmonids.

The flood hazard conditions to be monitored include the stability of the structural elements (levees, revetments, engineered log structures, and box culvert), change in flood risks outside of the project area relative to pre-project conditions, and the containment of channel migration to within the project area. The County will also monitor site conditions that might pose a risk to infrastructure and recreation safety. Channel change will be monitored by comparing surveys of the floodplain and active channel. Frequency of channel change reviews will be dependent on the magnitude and frequency of sediment-transporting flows (approximately 3000 cfs) since the last survey (typically annual topobathymetric deemed of sufficient accuracy, assuming specifications are met) and the availability of funding to conduct the surveys and analyses. The County will monitor the locations and conditions of large wood placed as part of the project and naturally occurring large wood accumulating within the project reach. Monitoring will be conducted during and after large flood events to characterize changing patterns in wood loading and to evaluate the risks that accumulations of large wood might pose to recreational users, the Jan Road Levee and CRT Revetment facilities, other infrastructure and public safety. The observations of the large wood monitoring will be posted on the County's website of known hazards in King County rivers. Monitoring and reporting protocols will be modified as needed to address changing conditions.

4.3.2 Facility Inspection

The Jan Road Levee and CRT7 Revetment facilities will be inspected annually during summer, low-flow conditions (when most of the facility is visible) and immediately after major flood events. The low-flow inspection frequency may be reduced to bi-annually in accordance with County guidance for the river facility inspection program. The facilities will also be observed during major flood events (phase 4 or greater) by flood patrols for purposes of providing early detection of potentially hazardous conditions. As part of the flood emergency response protocols, King County dispatches flood patrols to inspect levees after an earthquake with a moment magnitude greater than 5.5 in the Puget Sound area. The routine and post-flood

inspections will document conditions using the standard King County facility inspection form and digital photographs. The inspections will identify and characterize the location, nature, and severity of any damage and note any follow-up assessments needed by an engineer, geologist, ecologist, or maintenance specialist. The inspections will also note any noxious or invasive weeds, viability of installed native plantings, accessibility issues, or any other maintenance concerns. The routine and post-flood (and post-earthquake) inspections will target specific elements of the Jan Road Levee and CRT 7 Revetment facilities:

Setback Levee

- Soil erosion or slumping on the landward and waterward slopes.
- Settlement along the levee crest.
- Seepage or piping through the levee.
- Sinkholes or sand boils on the landward side of levee.
- Overtopping or breaching.
- Interior drainage facilities (i.e. infiltration ditches and access ramp culvert).
- Large wood or other debris directing flow into the facility.
- Downed trees or damaged or distressed vegetation.
- High water mark indicators (locations flagged for future survey).

Levee Access Road

- Damage to gates at points of entry.
- Damage or wear to road surface.
- Vegetation encroaching into roadway.
- Illegally dumped waste.
- Illegal encampments.

197th Pl Box Culvert

- Damaged or blocked (vegetation, sediment, debris) inlet or outlet.
- Blocked outlet channel.

Engineered Log Structures (Biorevetment, floodplain and mainstem ELJs [including BWJs])

- Structure location and identification number.
- Missing key logs, piles, or racking wood placed during construction.
- Damage to hardware connections resulting in impact to design function (i.e. structural, boater safety)
- Large wood or other debris directing flows into the structure.
- Erosion of ballast material.
- Loss of rock armoring.
- Damaged or distressed native plantings.
- Presence of noxious and invasive weeds.
- Presence/absence of naturally occurring wood racked on the structure.
- Presence/absence of pool and gravel bars associated with structures.

Riparian Buffer along setback levee

- Erosion and evidence of channelization.
- Sediment deposition.
- Damaged or distressed native plantings.
- Presence of noxious and invasive weeds.

- Presence/absence of naturally occurring wood racked on floodplain structures and cottonwood and conifer boles.
- Illegal encampments.

CRT 7 Revetment (untreated [no BWJs] sections)

- Bank erosion.
- Location of thalweg and presence/absence of pool formation along toe.
- Large wood or other debris directing flow into the facility.
- Loss of rock armoring.
- Tree recruitment.
- Illegal encampments.

King County will use the information obtained from the periodic monitoring and inspections to perform preliminary assessments of potential hazards and risks to public safety. The County will then share this information with the appropriate jurisdictions and governmental agencies listed in Table 1.

4.3.3 Maintenance

Most of the project site will be maintained as a natural area. For the first several years, maintenance will focus on the establishment of native vegetation installed in the riparian buffer and on levee side slopes during construction. An irrigation system operating for the first two to three years after construction will require periodic adjustments and maintenance. Maintenance may also include chemical and physical weed control for the first three to four years after construction. Any damage to perimeter fencing, access gates, and signs will be promptly repaired. While native vegetation will be encouraged to grow on the side slopes of the levee, the gravel access road on the top of the levee will require periodic mowing to keep the road surface usable for vehicle access.

4.4 Adaptive Management Strategies

The findings from the monitoring and inspections will determine the need for adaptive management actions at the project site. The County will consider a range of adaptive management actions to address site conditions that may pose a risk to public safety, threaten the structural integrity of the flood facilities, or indicate habitat parameters that do not meet the performance standards for project effectiveness required by the federal and state permits. Alternatives for adaptive management actions will be developed in collaboration with regulatory agencies, Muckleshoot tribe and Washington Department of Fish and Wildlife representatives, and river recreation groups such as the River Safety Council. Any actions taken by the County will be in accordance with all regulatory requirements, King County Public Rules and DNRP policies, procedures, and guidelines for the management and maintenance of flood facilities and in-stream projects.

4.4.1 Public Outreach and Education

Prior to project construction, King County implemented public outreach to alert river recreational users, the general public, and the local jurisdictions to the construction periods and the potential for changing river conditions following construction. The County has posted updated

information regarding large wood hazards on the County's website of known hazards in King County rivers, and maintained communications with the local jurisdictions and river recreational groups. Additional measures may consider placing signs at upstream parks that river users are likely to use as put-in locations. When warranted, signs may also be placed on bridges upstream of the project site to notify boaters of potentially hazardous conditions and possible take-out locations to avoid these hazards.

4.4.2 Levees and Revetments

Damage that has already occurred or that appears imminent to any segment of the new Jan Road levee or CRT 7 Revetment would be addressed on a case-by-case basis by King County in coordination with the local jurisdictions, regulatory agencies, Tribal representatives and adjacent property owners. The main goals of any adaptive management action would be aimed at protecting public safety and minimizing future maintenance costs of the facility.

If damage to levees or revetments maintained by agencies other than King County is observed or deemed to be imminent, King County would report the observations to the levee/revetment owner and participate in coordinated efforts with the local jurisdictions to assist by providing technical assistance to assess the hazard and develop options for possible emergency response actions. Emergency actions occurring on property owned by King County would be conducted upon approval from the WLRD Director.

4.4.3 Roadway and Drainage

King County would coordinate with the local property owners to address stormwater concerns if related to the operation of the project. The SE 197th Place box culvert is intended to provide safe egress (less than six inches of water over roadway) for the neighborhood during flood events up to and including the 100-year flood. King County will operate and maintain the culvert to ensure that the facility functions as intended, this may include mobilization of heavy equipment should a blockage (sediment, debris) be impacting the functionality of the facility during floods. Potential adaptive management actions before a flood event might involve public outreach to residences to inform them of the potential for flooding and the construction of temporary berms, the strategic placement of sandbags, or the deployment of pumps.

4.4.4 Large Wood

King County will lead the coordination with the local jurisdictions, regulators, Tribal representatives and first responders (e.g., police departments and regional fire districts) to assess the need for wood removal or relocation within the project site to address identified hazards to public safety. The King County Sheriff's Office (KCSO) would be consulted for technical assistance and development of potential actions to address public safety concerns, which may include regulation or restriction of river access to recreational users. Activities involving the placement, repositioning, or removal of large wood from stream or river channels require the issuance of a Hydraulics Project Approval (HPA) from the Washington Department of Fish and Wildlife and consultation with the Tribes. Should these activities occur, they would typically involve some form of mitigation to offset impacts to aquatic habitat.

4.5 Agency Contact Information

Table 2. List of Agency Contacts.

Jurisdiction or Agency	Contact Name	Phone Number
King County Office of Emergency Management	Duty Officer	206-296-3830
King County River and Floodplain Management Section, Water and Land Resources Division	Chris Brummer, Supervising Engineer Dan Heckendorf, Sr. Engineer Thomas Bannister, Sr. Ecologist Alex Lincoln, Sr. Ecologist	206-477-4655 (office) 206-477-8459 (office) 206-263-6952 (office) 206-263-0989 (office)
King County Sheriff's Office, Marine Rescue and Dive Unit	Richard Barton, Sergeant	206-477-0755 (office) 206-423-9607 (mobile)
Seattle Public Utilities (SPU)	Paul Faulds	206-615-0021 (office) 206-423-2280
King County Fire District 43 – Maple Valley Fire Department	Camille Walls	425-432-0200

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